November 2, 2009

Mr. Jerald G. Head
Senior Vice President, Regulatory Affairs
GE Hitachi Nuclear Energy
3901 Castle Hayne Road MC A-18
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 388 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Head:

By letter dated August 24, 2005, GE Hitachi Nuclear Energy (GEH) submitted an application for final design approval and standard design certification of the economic simplified boiling water reactor (ESBWR) standard plant design pursuant to 10 CFR Part 52. The U.S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed design.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter.

If you have any questions or comments concerning this matter, you may contact me at 301-415-3179 or Ilka.Berrios@nrc.gov or you may contact Amy Cubbage at 301-415-2875 or Amy.Cubbage@nrc.gov.

Sincerely,

/RA/

Ilka Berrios, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-010

Enclosure:
Request for Additional Information

cc: See next page

November 2, 2009

Mr. Jerald G. Head
Senior Vice President, Regulatory Affairs
GE Hitachi Nuclear Energy
3901 Castle Hayne Road MC A-18
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 388 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Head:

By letter dated August 24, 2005, GE Hitachi Nuclear Energy (GEH) submitted an application for final design approval and standard design certification of the economic simplified boiling water reactor (ESBWR) standard plant design pursuant to 10 CFR Part 52. The U.S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed design.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter.

If you have any questions or comments concerning this matter, you may contact me at 301-415-3179 or Ilka.Berrios@nrc.gov or you may contact Amy Cubbage at 301-415-2875 or Amy.Cubbage@nrc.gov.

Sincerely,

/RA/

Ilka Berrios, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-010

Enclosure:
Request for Additional Information

cc: See next page

Distribution: See next page

ADAMS ACCESSION NO. ML093020624

OFFICE	PM:NGE1	LPM:NGE1
NAME	IBerrios	ACubbage
DATE	11/02/09	10/31/09

OFFICIAL RECORD COPY

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 388 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION DATED NOVEMBER 2, 2009

Distribution:
PUBLIC

Hard Copy
NGE1 R/F
IBerrios, NRO
ACubbage, NRO

E-Mail:
RidsNroDnrlNge1
RidsAcrsAcnwMailCenter
RidsOgcMailCenter
RidsNroDeCib2
HWagage, NRO
JMcKirgan, NRO
CHinson, NRO
YLi, NRO
CMunson, NRO
TFrye, NRO

Requests for Additional Information (RAIs)
ESBWR Design Control Document (DCD), Revision 5

RAI Number	Reviewer	Question Summary	Full Text
RAI 2.5-11	Li Y	Update Table 5.1-1 (Tier 1) and Table 2.0-1 (Tier 2) in terms of the minimum bearing capacity for both static and dynamic	In Table 5.1-1(Tier 1) and Table 2.0-1 (Tier 2) of the ESBWR DCD Revision 6, the maximum static bearing demands and the maximum dynamic bearing demands were specified for seismic category I structures founded on soft, medium and hard soil sites. The DCD uses these parameters to define the capability of foundation supporting materials to resist any seismic or non-seismic input generically (the subsurface materials must have minimum bearing capacity greater than the maximum bearing demand with a factor of safety). The DCD parameters are not targeting any particular site-specific soil type or any particular demand and the definition of the soil properties in terms of “demand” is not consistent with other regulatory documents and other DCDs, which define them in terms of “capacity.” GEH is requested to update the tables in terms of the minimum bearing capacity for both static and dynamic, and also revise footnote (7) to indicate that the minimum bearing capacity should be greater than the maximum bearing demand with a factor of safety
RAI 6.3-89	Scarbrough T/ Thomas G	Provide additional detail for GDCS design features in the DCD	At the ACRS briefing on October 21, 2009, GEH described the design attributes, ITAAC, and in-service testing activities to provide assurance that the ESBWR Gravity-Driven Cooling System (GDCS) will provide adequate reactor core cooling flow in the event of a loss of coolant accident. The NRC staff requests that GEH revise the DCD to clarify that the GDCS injection and equalization lines will be designed to have a specific minimum slope as they approach the reactor pressure vessel to inhibit steam or non-condensable gases from entering the GDCS piping. In addition, GEH stated that the GDCS squib valves will have a sample of their initiators test-fired prior to initial plant operation to avoid potential common cause failure. Please include this requirement in the DCD.
RAI 6.4-22	O’Driscoll J	Ensure that it is clear in the DCD that an ESBWR COL applicant must provide justification for a zero or near zero cfm CRHA access and	In letter MFN 09-551, dated August 17, 2009, GEH provided a detailed discussion in response to Control Room Habitability Area (CRHA) Meeting Open Topic #6 (see ML091760538 for the meeting summary). The GEH response provided justification as to why, as a result of the existence of the CRHA vestibules, a COL applicant could justify the establishment of a near zero limit for CRHA inleakage attributed to CRHA access/egress.

RAI Number	Reviewer	Question Summary	Full Text
		egress leakage value in the TS leakage program manual in order to meet the dose analysis unfiltered air inleakage assumption.	The assumption of such a low value, to be considered as an allowed departure from the 10 cfm infiltration value provided for such leakage by SRP 6.4, requires further justification in the DCD. In consideration for this, include a discussion in the DCD Tier 2, Section 6.4 or in DCD Chapter 16, Technical Specification Section 5.5.12, that more explicitly states the unique ESBWR requirement for determining the unfiltered air in leakage past he CHRHA boundary; in that the ESBWR CHRA design assumes a zero or near zero value for CRHA access and egress leakage limit. Clarify in the DCD that a COL applicant must justify this limit in the leakage program manual, in view of SRP 6.4 section III.3.Eiii Note 4.
RAI 6.4-23	O'Driscoll J	Provide additional details in the DCD Tier 2 and Tier 1 to address back flow prevention, minimum CR, alarm and control requirements, required surveillance requirements, role in emergency procedures and the seismic and safety related design of the variable leakage device.	DCD, Tier 2, Subsection 6.4.4 states that a variable leakage device, located under the raised floor to facilitate air circulation and mixing, is provided with sufficient adjustment to maintain the required airflow and CRHA positive pressure relative to adjacent areas under all normal and emergency conditions requiring operation of the CRHA air handling unit (AHU) or emergency filter unit (EFU). Periodic monitoring of the CRHA air intake flows and positive CRHA differential pressure is performed during operation of the CRHA AHU or EFU. DCD, Tier 2, Figure 9.4-1, CRHAVS Simplified System Diagram shows the variable orifice relief device as a box like object, however there is no specific CBVS description of the device in the DCD. Staff cannot make a judgment if the design of this portion of the system meets SRP 9.4.1 design and inservice inspection and testing requirements. DCD, Tier 2, Table 3.2.1 Classification summary does not list this device. Therefore it is unclear as to what Safety Classification or seismic category the device will be designed to meet. The following information is requested: 1. Provide a more detailed description of the function of the device in DCD Tier 2 Section 9.4.1.2, System Description such that NRC staff can make a determination if this portion of the CRHAVS will meet SRP 9.4.1 guidelines. Detail should include but is not limited to a description of how backflow through the device will be prevented, a description of the

RAI Number	Reviewer	Question Summary	Full Text
			purpose of MCR alarm function associated with this device. Provide a description of required operator actions as a result of main control room (MCR) alarm in DCD Tier 2 Section 9.4.4 and required operator actions. 2. List the device as part of U77 Control Building HVAC system in DCD, Tier 2, Table 3.2.1, provide seismic and safety related design criteria. Modify DCD, Tier 1, Table 2.16.2-3, as needed. 3. Add an ITAAC for the control building differential pressure alarm (e.g. in Table 2.16.2-4), or; alternatively, provide justification why it should not be listed.
RAI 9.4-29 S04	O'Driscoll J	Include additional design information regarding the EFU delivery and discharge system in Tier 2 of the DCD.	In DCD Revision 6 GEH added the following statement in section 6.4.2 and Section 9.4.1.1 System Design basis: "The EFU delivery and discharge system is optimized to ensure that there is adequate fresh air delivered and mixed in the CRHA. This is accomplished by using multiple supply registers, which distribute the incoming supply air with the Control Room air volume, and a remote exhaust to prevent any short cycling. The EFU operation results in turning over the Control Room volume approximately 7-9 times per day. This diffusion design (mixing and displacement) in conjunction with the known convective air currents (due to heat loads/sinks) and personnel movement ensures that occupied zone temperature is within acceptable limits, buildup of contaminants (e.g., CO2) minimal, and a freshness of air is maintained." 1. This paragraph has the term "occupied zone." Based on the response to RAI 9.4-29 S03 and previous responses to this RAI, NRC staff understands the CRHA "occupied zone" to be a subset of the CRHA, specifically the MCR area from the top of the raised floor to an elevation of two meters. GEH stated that this would be the region where operators are expected to be stationed during accident conditions. In addition GEH provided additional EFU delivery and discharge design information in the response to RAI 9.4-29 S02, where GEH stated that the EFU does not supply air to the bathroom, kitchen, shift supervisors

RAI Number	Reviewer	Question Summary	Full Text
			office and other areas not continuously occupied during emergency conditions. The staff considered this design information when evaluating the suitability of the control building ventilation system (CBVS) to maintain a habitable environment during design basis accidents. In order to provide that, when built, the EFU delivery and discharge system will be correctly optimized to preferentially deliver air to those areas of the CRHA that are expected to be occupied, in Tier 2 Sections 6.4 and 9.4.1, include a definition of the term "CRHA occupied zone" in respect to what areas of the of the CRHA will be preferentially delivered forced air by the EFU delivery and discharge system. In addition, in Tier 2 Chapters 6.4 and 9.4.1, specify those areas of the CRHA that the EFU delivery and distribution system is not designed to serviced with forced air. 2. The above statement added to Revision 6 also discusses the design concern of "short cycling," i.e. a condition where fresh air entering the CRHA stratifies to a degree that it does not provide the anticipated breathing quality air to the CRHA occupied zone, or bypasses the CRHA occupied zone to the remote exhaust. In response to RAI 9.4-29, GEH added a controlled leakage path to the CRHA air outlet connections as a means of assuring that the design EFU flow rate of 466 cfm will be supplied. In subsequent responses to this RAI GEH provided a GOTHIC heat up analysis which demonstrated the potential for convective currents and air flow, and further justified the placement of the controlled leakage device below the CRHA occupied zone. The above DCD statement implies that the placement of the controlled leakage device is the sole means to address the concern of the adverse effects of thermal stratification and short cycling in the ESBWR CRHA design. Since GEH uses a simple single node analysis (using the CONTAIN code), which assumes a uniformly mixed CRHA, yet bases its argument on adequate air quality on a non-uniformly mixed CRHA, the ESBWR design basis heat up analysis does not model this concern, and subsequent ITAAC to update this model with as-built information

RAI Number	Reviewer	Question Summary	Full Text
			would not be able to detect those CRHA design changes that cause adverse consequences for short cycling of supply air. Therefore staff requires that more specific discussion of the potential of short cycling, and the EFU delivery and discharge system, control building (CB) and CBVS design features designed to mitigate this phenomenon is required in the DCD. Such information could include the following: a. Add Enclosure 1 of MFN 09-380 "Figure 9.4-29 S3-2, Control Room Habitability Areas Airflows Emergency Operation" or similar illustrative drawing of the design intent of airflows in the CRHA, to Tier 2 of the DCD. Illustrative drawings, which describe how mixing occurs, should be added to the DCD to capture the insights obtained from the GOTHIC analyses. b. Describe requirements for emergency actions (i.e., when the EFU is providing ventilation to the CHRA) to promote convective currents and improve CRHA air quality, such as identifying specific doors to be shut in the CRHA. c. Provide more specific discussion of any other design features or actions that will assure that the CRHA will be optimized to prevent short cycling and promote the development of convective air flows in the CRHA.
RAI 9.4-55	O'Driscoll J	Provide more specific Heatup analysis description for the CRHAVS passive heat sink in the DCD Tier 2. Provide more specific description of the analysis to be updated in DCD Tier 1 ITAAC Table.	DCD Tier 1, (Rev 6) Table 2.16.2-4, inspections Tests, Analyses and Acceptance Criteria (ITAAC) 4i and 4ii describes the design commitment, analysis and acceptance criteria for the CRHA passive heat sink for summer and winter conditions respectively. As described in the table, the terms "control room design-basis heat up analysis", "winter design-basis heat up analysis" and the "thermal analysis" are undefined. In letter, MFN 09-525, dated August 4, 2009 and titled "Transmittal of ESBWR CRHA Heatup Calculation, including Applicable Input and Output Data Files" You include Enclosure 1 which is titled "Document No. 092-134-F-05011, Issue 1, Control Building Environmental Equipment Qualification Temperature

RAI Number	Reviewer	Question Summary	Full Text
			Sensitivity Analysis". Do you intend enclosure 1 to be the "design-basis thermal analysis" for the CB? In order to ensure that the verification methodology remains constant, the ITAAC needs to be clearly linked to a Tier 2* description of the verification methodology. Tier 1, Table 2.16.2-4, ITAAC 4i and 4ii, will likely need to be revised to accomplish this. The staff expects that to satisfy the ITAAC an applicant will update a report containing the design basis heat up analysis with as-built information and other changes such that it is clear to a reviewer what information or methodology has changed from the reports used by the staff when the DCD was reviewed. The staff expects that that the same methodology (i.e. computer code and associated code coefficients) will remain the same for both analyses. This could be accomplished by making the description of the methodology Tier 2* as described below. The staff expects that at a minimum, the same input parameters as stated in Tier 2 Table 3-H-14 be updated with as-built values. The Tier 2* analysis description should specify the analysis methodology by identifying every parameter used in the report previously submitted to the staff for review. Tier 1 and the Tier 2* section should use the same terms to identify the design bases analyses, such as "control room design-basis heat up analysis" and "winter design-basis heat up analysis." Specify in Tier 2* tables what heat sink dimensions, heat sink thermal properties, heat transfer coefficients, and other parameters subject to as-built conditions are part of the design bases analyses to clearly identify what parameters may be updated. As a minimum these should include those parameters listed in Tier 2 Table 3H-14. In addition, any other program constants or coefficients should be included in a Tier 2* Table, so that they cannot be changed without prior staff approval. This level of detail is required to provide confidence that the analysis methodology will remain unchanged, and NRC staff will be able to clearly identify differences between the design basis heat up analysis and the ITAAC verification heat up analyses. The Tier 2* analysis description should also include the key assumptions used by the heatup analyses in the design basis of the ESBWR, The design basis thermal analyses should be incorporated into the DCD Tier 2 to clearly identify

RAI Number	Reviewer	Question Summary	Full Text
			the analyses used for design certification and to provide a comparison for the updated as-built analyses performed for the ITAAC closure. Therefore include the design basis CRHA heat up analyses in Tier 2 of the DCD.
RAI 9.4-56	O'Driscoll J	Provide additional justification for methodology and assumptions used in the ESBWR CRHA Heatup Calculation	In GEH letter MFN 09-525, dated August 4, 2009 and titled "Transmittal of ESBWR CRHA Heatup Calculation, including Applicable Input and Output Data Files," GEH included Enclosure 1 which is titled "Document No. 092-134-F-05011, "Issue 1, Control Building Environmental Equipment Qualification Temperature Sensitivity Analysis." The staff has reviewed this calculation and the associated CONTAIN input and output files. The staff has identified a potential discrepancy between the input files and the approach described in the calculation. The initial temperatures for all heat structures in CONTAIN input file for Step 3 were directly copied from Step 1's results. It does not reflect the intent of Step 2 as described in the Report (Document No. 092-134-F-M-05011, Issue 1, Control Building Environmental Equipment Qualification Temperature Sensitivity Analysis). An update of all heat structure temperatures with the Step 2 run is required if Step 2 is considered. Note that even though the temperature increase may be slight as described in Section 3.4.2, this update is still required since the margin of the main control room temperature is already small (~ 1ºF).
RAI 9.4-57	O'Driscoll J	Describe necessary configuration controls to maintain the validity of critical assumptions regarding the ESBWR CB and RB passive heat sinks.	In DCD sections 9.4.1, 9.4.6 and 6.4, GEH describes design features of the passive heat sinks that provide assurance that the equipment zone temperatures will remain below the design basis limits that are established for equipment qualification and habitability. In Tier 1, GEH includes ITAAC that must be performed using as-built information to verify that critical design information such as heat sink thermo-physical properties and geometry confirms the analysis results. 1. What controls will be in place to ensure that these critical assumptions and parameters will be maintained throughout the life of the plant? The application of passive heat sinks to a normally occupied area is currently a unique application. In occupied spaces, actions normally considered of no consequence to design basis assumptions, such as hanging pictures on walls, installing rugs, painting walls etc., may have adverse consequences on the ESBWR control room passive heat sink

RAI Number	Reviewer	Question Summary	Full Text
			design. Similar considerations are applicable to the reactor building. The staff considers this issue as something that should be specifically addressed in the certification information. 2. In regard to the CRHA heat up analysis, a significant percentage of the heat load is due to people. Although, DCD Tier 2, Table 9.4-1 indicates that breathing air is adequate for up to 11 persons, the DCD does not discuss how MCR occupancy would be monitored and limited during accident events in order to maintain this design basis parameter. Conditions during accidents such as shift turnover or need for the presence of supplementary personnel could cause assumptions regarding CRHA heat load and fresh air adequacy to be inadvertently invalidated. Identify where you address this concern in the DCD or add additional description of the controls as appropriate.
RAI 9.4-58	O'Driscoll J	Provide a specific Reactor Building Heatup analysis description in DCD Tier 2. Provide RB HVAC ITAAC to demonstrate that the as-built RB passive heat sink will maintain RB plant zones at or below those maximum analyzed temperatures specified in Tier 2 table 3H-15.	Tier 1 (Rev 6) Table 2.16.2-4, inspections Tests, Analyses and Acceptance Criteria you include (ITAAC) 4i and 4ii that describes the design commitment, analysis and acceptance criteria for the CRHA passive heat sink. In order to ensure that critical assumptions regarding the RB passive heat sink performance will be validated similar ITAAC for the RB passive heat sink is required. In order to ensure that the verification methodology remains constant, the RB HVAC ITAAC needs to be clearly linked to a Tier 2* description of the verification methodology. Revise the Tier 1 Table 2.16.2-2 to add an ITAAC design commitment that the RBVS heat sink passively maintains the temperature of the specified RB plant zones within an acceptable range for the first 72 hours following a design basis accident. ITAAC comparable to Tier 1, Table 2.16.2-4, ITAAC 4i and 4ii, as revised in response to RAI 9.4-55, will need to be added to the RB HVAC ITAAC to accomplish this. The staff expects that to satisfy the ITAAC an applicant will update a report containing the design basis heat up analysis with as-built information and other changes such that it is clear to a reviewer what information or methodology has changed from the reports used by the staff when the DCD was reviewed. The staff expects that that the same methodology (i.e. computer code and

RAI Number	Reviewer	Question Summary	Full Text
			associated code coefficients) will remain the same for both analyses. This could be accomplished by making the description of the methodology Tier 2* as described below. The staff expects that at a minimum, the same input parameters as stated in Tier 2 Table 3-H-14 be updated with as-built values. The Tier 2* analysis description should specify the analysis methodology by identifying every parameter used in the report previously submitted to the staff for review. Tier 1 and the Tier 2* section should use the same terms to identify the design bases analyses, such as “reactor building design-basis heat up analysis” and “reactor building winter design-basis heat up analysis.” Specify in Tier 2* tables what heat sink dimensions, heat sink thermal properties, heat transfer coefficients, and other parameters subject to as-built conditions are part of the design bases analyses to clearly identify what parameters may be updated. As a minimum these should include those parameters listed in Tier 2 Table 3H-14. List in Tier 2* tables all plant zones subject to verification. As a minimum these should include those zones specified in Tier 2 Table 3H-15. In addition, any other program constants or coefficients should be included in a Tier 2* Table, so that they cannot be changed without prior staff approval. This level of detail is required to provide confidence that the analysis methodology will remain unchanged, and NRC staff will be able to clearly identify differences between the design basis heat up analysis and the ITAAC verification heat up analyses. The Tier 2* analysis description should also include the key assumptions used by the heatup analyses in the design basis of the ESBWR, The design basis thermal analyses should be incorporated into the DCD Tier 2 to clearly identify the analyses used for design certification and to provide a comparison for the updated as-built analyses performed for the ITAAC closure. Therefore include the design basis reactor building environmental heat up analysis in Tier 2 of the DCD.
RAI 12.4-19 S05	Hinson C	Clarify your response to various parts of RAI 12.4-19 S04 with respect to the description of various dimensions of the IFTT. Provide your	There appear to be several inconsistencies in your response to RAI 12.4-19 S04. Please modify your response to address the following issues: a. Item b) 1) of the staff’s RAI requests that GEH provide its reasons for changing the radius of the steel tube. In your response you state that the steel tube radius was changed “for the purpose of the shielding evaluation” (you also state that cost factors and seismic requirements

RAI Number	Reviewer	Question Summary	Full Text
		basis for some of the dose rate and shield wall thicknesses listed in Table 2 of RAI 12.4-19 S03.	were other reasons for changing the tube radius). Provide a more thorough description of what role the shielding evaluation had in the decision to reduce the radius of the steel tube from 15” to 12” (such a reduction in the tube radius would decrease the thickness of the water shielding between the fuel assembly and the steel tube and therefore increase the dose rate from the fuel assembly). b. In your response to item 8 a) of RAI 12.4-19 S03 (requesting a list of modified shielding assumptions), you stated that the thickness (1.27 cm) of the transfer tube did not change. If the transfer tube thickness did not change, explain why, in your response to RAI 12.4-19 S04, you provide a comparison of the thickness of the IFTT wall thickness with the BWR-6 wall thickness in item b)1) of your response. c. GEH response to item b) 2) of RAI 12.4-19 S04 states that the “radius of the guard tube was changed to accommodate the larger steel tube…” However, in your response to b) 1), you state that the IFTT steel tube was reduced in radius, not increased in radius. Modify your response to this item to reflect that fact that the IFTT steel tube was made smaller (in diameter), not larger. Since the IFTT steel tube was made smaller in diameter, not larger, provide the justification for increasing the radius of the guard tube from 16 to 18 inches. d. It is unclear from your response whether lead shielding will be used to provide additional shielding around the IFTT when it passes through the interior of a room. GEH response to item b) 4) of RAI 12.4-19 S04 states that “The previously reported dose rates did not credit 10 or 15 cm of lead when the transfer tube passes through the interior of a room. Letter MFN 06-499 Supplement 2 was misleading as it indicated lead shielding had been credited in the calculation of the dose rate around the IFTT.” However, note 7 for DCD Figure 12.3-10 states that the wall thickness between Room 1401 and the trapezoidal room must be 200 cm of concrete shielding, equivalent to 150 cm of concrete plus 10 cm of lead.” Specify if lead shielding will be used to provide additional shielding for the IFTT. If not, provide your justification for describing this shielding in the notes to some of the DCD layout drawings.

RAI Number	Reviewer	Question Summary	Full Text
			e. In response to item c of RAI 12.4-19 S02, GEH provided a list of physical controls, interlocks, and an annunciator that will serve to prevent access to any area adjacent to the IFTT which has a radiation class classification higher than "A". Include a listing of these controls and interlocks in the appropriate section of the Chapter 12 DCD. On October 2, 2009, the staff held a telecom with GEH to discuss the following additional instances where either GEH's responses to portions of RAI 12.4-19 were unclear or where GEH did not address the reasons for changes to dose rates in the vicinity of the IFTT. In RAI 12.4-19 S02, the staff notified GEH that the applicant had used an incorrect shielding code input parameter when calculating the dose rates from the IFTT. The use of this incorrect input parameter by GEH resulted in estimated dose rates from the IFTT (during the transfer of a spent fuel assembly in the IFTT) that were smaller by a factor of approximately ten than the dose rates calculated by the staff's contractor. In supplemental 2 to this RAI, the staff asked GEH to correct the erroneous shielding code input parameter and describe the effects of this change on the calculated dose rates in various rooms/areas surrounding the IFTT. In GEH's response to this supplement 2 RAI, GEH provided a table (Table 2) listing, for each of the rooms adjacent to the IFTT, the concrete shielding thickness of the room wall adjacent to the IFTT and the resulting dose rate and radiation zone designation in each room. In reviewing this table, the staff noted that there was no clear indication of what table parameters had changed (e.g., dose rates, shield wall thickness) as a result of GEH's correction of the erroneous shield code input parameter. As part of the staff's supplement 3 RAI, the staff asked GEH to describe "how these dose rates compare with the calculated dose rates provided in response to the initial RAI 12.4-19." In GEH's response to this supplement 3 RAI, GEH stated "Because there are significant differences with respect to the first response, no detailed comparison is performed but the differences in the results obtained are considered to be justified." This response is unacceptable since it does not address the staff's concern with respect to what parameters had changed (e.g., dose rates, shield wall thickness) as a result of GEH's correction of the erroneous shield code input parameter.

RAI Number	Reviewer	Question Summary	Full Text
			f. The staff compared the radiation zone designations listed in Table 2 with the dose rate designations for the same rooms depicted in an earlier version of plant layout Figure 12.3-10. On the basis of this comparison, it appears that GEH's correction of the erroneous shield code input parameter did not result in an increase in the dose rate designations for any of the rooms adjacent to the IFTT. For each of the rooms listed in Table 2, provide a justification as to why the radiation zone designation in Table 2 did not increase as a result of GEH's correction of the erroneous shield code input parameter. g. Although Table 2 lists concrete shielding thicknesses for each of the rooms adjacent to the IFTT, it is unclear which, if any, of these concrete shielding thicknesses listed in Table 2 were increased (in order to prevent the associated room dose rates from increasing) as a result of GEH's correction of the erroneous shield code input parameter. For each of the rooms listed in Table 2, provide a listing of what changes were made in the thickness of the adjoining concrete walls as a result of GEH's correction of the erroneous shield code input parameter. h. Note 1 to Figure 12.3-10 in Rev. 6 of the DCD states that the dose rate in rooms 1702 and the trapezoidal room is classified as radiation zone J (> 5 Sv/hr) during fuel transfer. In an earlier revision (Rev. 3) of the DCD, Note 1 to Figure 12.3-10 states that these same areas are classified as being a lower radiation zone, zone I (<5 Sv/hr), during fuel transfer. By increasing the dose rate for these areas to zone J during spent fuel transfer, these areas become classified as Very High Radiation Areas, per the definition in 10 CFR 20.1602. Describe what plant modification was made that resulted in the increase in the zone designation from zone I to zone J during spent fuel transfer for the areas identified by Note 1 to DCD Figure 12.3-10.
RAI 12.4-40	Hinson C	Justify the hours used in the dose assessment for refueling operations when the robotically controlled automated	DCD, Tier 2, Subsection 12.4.4, "Refueling Operations" discusses the man hours and doses associated with refueling operations and forms the basis for the dose estimates for refueling operations shown in Table 12.4-5 and Table 4-1. In Revision 5 of the DCD, Section 12.4.4 stated that "refueling exposures are also decreased by the use of the robotically controlled automated refueling platform." It also stated that operators work in an enclosed

RAI Number	Reviewer	Question Summary	Full Text
		refueling platform will no longer be part of the ESBWR design.	automation center off the refueling floor and states that the use of this robotically controlled automated refueling platform and automation center are the basis for assuming that refueling operations can be accomplished in 1500 person-hours instead of the 4400 person-hours needed in a typical BWR. In Revision 6 to the DCD, reference to the use of a robotically controlled automated refueling platform has been deleted from Section 12.4.4, yet this Section still assumes that refueling operations can be accomplished in 1500 person-hours and this value of 1500 person-hours is still used as the basis of the dose estimate for refueling operations in Table 12.4-5. Provide your justification for the use of 1500 person-hours for refueling operations when the ESBWR design will no longer benefit from the time and dose savings associated with the use of a robotically controlled automated refueling platform.
RAI 12.7-5 S02	Hinson C	GEH must modify it's response to item c.i. of RAI 12.7-5 S01 to provide leakage monitoring of the cooling tower blowdown line in order to minimize the potential for unmonitored, uncontrolled releases of radioactivity to the environment	Your response to item c.i. of RAI 12.7-5 S01 addresses the ESBWR design features implemented to minimize the potential for unmonitored, uncontrolled releases of radioactivity to the environment from those SSCs which have buried piping. In your response, you state that the following SSCs will have associated piping segments which will be run underground; Condensate Storage Tank (CST) and CST Retention Area Drain, Radwaste Effluent Discharge Pipeline, Hot Machine Shop Drain Line, and Cooling Tower Blowdown Line. For the first three of these SSCs, you state that underground piping will be designed to preclude inadvertent or unidentified releases to the environment by either enclosing the piping within a guard pipe which is monitored for leakage or making the piping accessible for visual inspection via an accessible trench or tunnel. The staff finds that these methods of monitoring for leakage meet the intent of 10 CFR 20.1406. However, you state that GEH finds that it is impractical to implement these features for the underground portion of the cooling tower blowdown line because this line is significantly larger and longer than the pipes for the other three SCCs listed above. You also state that it is GEH's opinion that this line does not require these additional design features because, from a radiological viewpoint, the contents of this line are already released to the environment. You state that the radiological monitoring and control that is performed for radwaste effluent occurs upstream (i.e. before) it is introduced to the cooling

RAI Number	Reviewer	Question Summary	Full Text
			tower blowdown sump and, if radioactivity levels in the radwaste effluent exceed the pre-established setpoint, flow will be shutdown before it reaches the cooling tower blowdown sump. As such, you state that, for radiological discharges, the cooling tower blowdown sump is treated as the environment. This description of the discharge path beyond the cooling tower blowdown is inconsistent with NRC guidance of RGs 1.143 and 1.206 and SRP Section 11.2. The NRC guidance states that applicants should define the boundary of the LWMS beginning at the interface from plant systems provided for the collection of process streams and radioactive liquid wastes to the point of controlled discharge to the environment (as would be defined in an Offsite Dose Calculation Manual (ODCM)), or at the point of recycling to the primary or secondary water system storage tanks for liquids and liquid wastes produced during normal operation and anticipated operational occurrences. The description provided in you response to part c.i of this RAI appears to exclude a segment of the discharge path, i.e., from the cooling tower blowdown to the point of release into the environment beyond the owner-controlled area or EAB. Modify you response to show how you plan to monitor the cooling tower blowdown line for leakage in order to minimize the potential for unmonitored, uncontrolled releases of radioactivity to the environment.

cc:

Ms. Michele Boyd
Legislative Director
Energy Program
Public Citizens Critical Mass Energy
  and Environmental Program
215 Pennsylvania Avenue, SE
Washington, DC 20003

Mr. Tom Sliva
7207 IBM Drive
Charlotte, NC 28262

DC GE - ESBWR Mailing List

Email

aec@nrc.gov (Amy Cubbage)
APH@NEI.org (Adrian Heymer)
awc@nei.org (Anne W. Cottingham)
bevans@enercon.com (Bob Evans)
BrinkmCB@westinghouse.com (Charles Brinkman)
cberger@energetics.com (Carl Berger)
charles.bagnal@ge.com
charles@blackburncarter.com (Charles Irvine)
chris.maslak@ge.com (Chris Maslak)
CumminWE@Westinghouse.com (Edward W. Cummins)
cwaltman@roe.com (C. Waltman)
Daniel.Chalk@nuclear.energy.gov (Daniel Chalk
david.hinds@ge.com (David Hinds)
david.lewis@pillsburylaw.com (David Lewis)
David.piepmeyer@ge.com (David Piepmeyer)
donaldf.taylor@ge.com (Don Taylor)
erg-xl@cox.net (Eddie R. Grant)
gcesare@enercon.com (Guy Cesare)
GEH-NRC@hse.gsi.gov.uk (Geoff Grint)
GovePA@BV.com (Patrick Gove)
gzinke@entergy.com (George Alan Zinke)
hickste@earthlink.net (Thomas Hicks)
hugh.upton@ge.com (Hugh Upton)
james.beard@gene.ge.com (James Beard)
jerald.head@ge.com (Jerald G. Head)
Jerold.Marks@ge.com (Jerold Marks)
jgutierrez@morganlewis.com (Jay M. Gutierrez)
Jim.Kinsey@inl.gov (James Kinsey)
jim.riccio@wdc.greenpeace.org (James Riccio)
JJNesrsta@cpsenergy.com (James J. Nesrsta)
joel.Friday@ge.com (Joel Friday)
John.O'Neill@pillsburylaw.com (John O'Neill)
Joseph_Hegner@dom.com (Joseph Hegner)
junichi_uchiyama@mnes-us.com (Junichi Uchiyama)
kimberly.milchuck@ge.com (Kimberly Milchuck)
KSutton@morganlewis.com (Kathryn M. Sutton)
kwaugh@impact-net.org (Kenneth O. Waugh)
lchandler@morganlewis.com (Lawrence J. Chandler)
lee.dougherty@ge.com
Marc.Brooks@dhs.gov (Marc Brooks)
maria.webb@pillsburylaw.com (Maria Webb)
mark.beaumont@wsms.com (Mark Beaumont)
Marvin.Smith@dom.com (Marvin L. Smith)
matias.travieso-diaz@pillsburylaw.com (Matias Travieso-Diaz)

DC GE - ESBWR Mailing List

media@nei.org (Scott Peterson)
mike_moran@fpl.com (Mike Moran)
MSF@nei.org (Marvin Fertel)
mwetterhahn@winston.com (M. Wetterhahn)
nirsnet@nirs.org (Michael Mariotte)
patriciaL.campbell@ge.com (Patricia L. Campbell)
paul.gaukler@pillsburylaw.com (Paul Gaukler)
Paul@beyondnuclear.org (Paul Gunter)
peter.yandow@ge.com (Peter Yandow)
pshastings@duke-energy.com (Peter Hastings)
rick.kingston@ge.com (Rick Kingston)
RJB@NEI.org (Russell Bell)
RKTemple@cpsenergy.com (R.K. Temple)
Russell.Wells@Areva.com (Russell Wells)
sabinski@suddenlink.net (Steve A. Bennett)
sandra.sloan@areva.com (Sandra Sloan)
sara.andersen@ge.com (Sara Anderson)
SauerB@BV.com (Robert C. Sauer)
sfrantz@morganlewis.com (Stephen P. Frantz)
stephan.moen@ge.com (Stephan Moen)
steven.hucik@ge.com (Steven Hucik)
stramback@westinghouse.com (George Stramback)
tdurkin@energetics.com (Tim Durkin)
timothy1.enfinger@ge.com (Tim Enfinger)
tom.miller@hq.doe.gov (Tom Miller)
trsmith@winston.com (Tyson Smith)
Vanessa.quinn@dhs.gov (Vanessa Quinn)
VictorB@bv.com (Bill Victor)
Wanda.K.Marshall@dom.com (Wanda K. Marshall)
wayne.marquino@ge.com (Wayne Marquino)
whorin@winston.com (W. Horin)